

the printer and an ink cartridge capable of being used is judged depending on whether said data coincides with data for discernment included in ROM or not.

(0003)

Further, in a printer disclosed in Japanese Patent Laid Open No. Hei 6-126981 (known example 2), a memory which memorizes the kind of the cartridge, the residual ink amount, or the like so that they can be rewritten is provided in the cartridge, a suitable cartridge is mounted in a recording device, and the residual ink amount can be grasped.

(0004)

(Problems to be solved by the Invention)

Though the printers disclosed in said respective known examples actuate the recording device effectively, there is further left a point to be improved.

(0005)

Namely, any ink cartridge mounted in the recording device is single, in which ink formation or the like is output by single unit. Therefore, when a plurality of ink cartridges exist for objects of every uses, fitness between ink in the ink cartridges is not judged, so that there was disadvantage in print quality or the like.

(0006)

A first problem to be solved by this invention is to provide what can grasp a using state of an ink cartridge and can timely carry out a recycle operation.

(0007)

A second problem to be solved by this invention is to provide what can write, into a memory section of the ink

cartridge, information such as a production date, a use starting date, the number of recycles, an ink end detecting date, temperature and humidity in the using environment, or the like, and can judge whether the recycle operation is effectively carried out or not by comparing the above information with a set value showing limit of lifetime.

(0008)

A third problem to be solved by this invention is to provide what can carry out a printing operation of high quality by use of the ink cartridge having the quality guaranteed all the time by timely performing the recycle operation.

(0009)

(Means for Solving the problems)

Corresponding means for solving said respective problems is as follows:

(0010)

(1) An ink jet recording apparatus characterized in that information of use history of an ink cartridge which includes a memory section for memorizing ink information or the like and can supplies ink to printing means of the ink jet recording apparatus can be written into said memory section in the ink cartridge.

(0011)

(2) The ink jet recording apparatus described in said(1), wherein said information of use history represents the number of recycles of the ink cartridge.

(0012)

(3) The ink jet recording apparatus described in said (1), wherein said information of use history represents a

production date and recycle date of the ink cartridge.

(0013)

(4) A method for recycling an ink cartridge which is a method for reproducing and utilizing an ink cartridge after use, wherein whether the ink cartridge can be recycled or not is determined by comparing the information memorized in the memory section of said ink cartridge so that it can be rewritten with set information stored in the ink jet recording apparatus.

(0014)

(5) The method for recycling the ink cartridge described in said (4), wherein said information memorized so that it can be rewritten is the information of use history and said set information stored in the ink jet recording apparatus is the information capable of recycle.

(0015)

(6) The method for recycling the ink cartridge described in said (4), wherein, wherein the information capable of being rewritten represents the number of recycles and said set information represents the number capable of recycle.

(0016)

(7) The method for recycling the ink cartridge described in said (4), wherein said information capable of being rewritten represents a production date and recycle date of the ink cartridge and said set information presents the limit of lifetime.

(0017)

(8) The method for recycling the ink cartridge described in said (4), wherein said information capable of being rewritten represents an ink end date of the ink cartridge and

said set information represents the number of dates which elapses after the ink end date.

(0018)

(9) The method for recycling the ink cartridge described in said (4), wherein said information capable of being rewritten represents using environment information of the ink cartridge and said set information represents a severe environment value.

(0019)

According to the above solving means, the ink cartridge can be usefully recycled timely.

(0020)

(Embodiment of the Invention)

A shown embodiment will be concretely described below.

(0021)

1 Ink cartridge 100

Characteristic of an ink cartridge 100 in this embodiment is that a memory section 10 capable of providing ink cartridge information or the like in relation to printing means described later is disposed.

(0022)

Namely, as shown in Fig. 2, at a bottom portion 21 of an ink storing section 20 of the ink cartridge 100, there is provided the memory section 10. As shown in Fig.4 which shows schematically constitution of the memory section 10, a memory medium 12 composed of RAM is arranged on a base plate 11, and an electrode group (c1 to c6) 13 which can be in contact with a contact group on an ink jet recording apparatus 200 side is provided and coupled to said memory medium 12 through a lead

section 14.

(0023)

Information of use history of the ink cartridge 100 such as a production date of the ink cartridge 100; ink information such as kind of ink, the residual ink amount, or the like; recycle number information showing the number of recycles; date information such as a recycle date of the ink cartridge 100 or the like; using environment information such as temperature, humidity or the like as using environment of the ink cartridge 100; or the like is previously memorized in the memory medium 12, and these information can be stored in a rewritable manner according to necessity.

(0024)

Further, in this ink cartridge 100, there is provided an ink end detecting section 40 for detecting ink end, and it is so constructed as to supply ink to a recording head 340 of the ink jet recording apparatus 200 from an ink supplying section 30. In this point, this ink cartridge is not much different from the conventional ink cartridge.

(0025)

According to necessity, the memory section 10 may be provided on the ink storing section 20 side.

(0026)

As an ink end detecting method, a method is considered in which the number of ink dots ejected from a head is counted in the printer main body, and presence and absence of ink is detected by comparing the counted number with the predetermined value.

(0027)

## 2 Ink jet recording apparatus (printer) 200

As shown in Figs. 1 and 2, in the printer 200, a cartridge mounting section 230 is provided on a carriage 220 disposed on a guide rod 210 in reciprocatively movable manner; a fixing lever 233 is provided rotatably at cartridge holder 231 for accommodating the ink cartridge 100 therein with a support shaft as a fulcrum; and a detecting section 240 is provided so that it can contact the electrode group (c1 to c6) 13 of said memory section 10 of the ink cartridge 100.

(0028)

Further, as shown in Fig. 1 as one example of constitution of printing means 250 connected to this detecting section 240, a controlling section 260 composed of CPU is provided to thereby actuate the printing means 250.

(0029)

Further, in the printer 200, there are provided reading means 280 for reading information memorized in the memory section 10 of the ink cartridge 100 and a writing means 290 for rewriting the information in the memory section 10; there are provided a temperature sensor 300 and humidity sensor 310 for detecting temperature and humidity in the environment of use of the ink cartridge 100, and an ink end detector 320; set information of recycle condition of the ink cartridge 100 is included in an internal memory section 330 in a readable manner; and all of them are connected to a controlling section 260.

(0030)

Next, the state of use of the printer will be described referring to a flowchart shown in Fig. 5.

(0031)

(1) print preparatory process

As described above, if the ink cartridge 100 which memorizes a production date, ink information and the like in the memory section 10 is mounted in the cartridge holder 231 of the printer 200 (S1), the ink supply section 30 is engaged with a recording head 340 thereby to be in a state capable of supplying ink, the electrode group (c1 to c6) 13 of the memory section 10 is connected to the detecting section 240 of the printer 200, and the information stored in the memory section 10, for example, a production date and recycle date of the ink cartridge 100, kind of ink, the residual ink amount, is read by the reading means 230 and informed of the controlling section 260 (S2).

(0032)

In this controlling section 260, whether the ink cartridge 100 is a recycle product or not is judged (S3); if the ink cartridge 100 is a new one, a mounting date thereof is written in the memory section 10 by the writing means 290 (S4); and if it is a recycle product, a mounting date thereof is written (S5) and the printing means 250 is slightly adjusted so that the printer 200 can fit the recycle product (S6).

(0033)

Hereby, the print preparation is completed.

(0034)

(2) printing process

Next, an instruction is given to the controlling section 260 by operating an operation panel (not shown) thereby to execute a printing operation (S7).

(0035)

For this time, a use starting date of the ink cartridge 100 is memorized in the memory section 10 by the writing means 290, and the using environment information of the ink cartridge 100 in the temperature sensor 300 and the humidity sensor 310 is also memorized sequentially in the memory section 10 (S8).

(0036)

Further, the number of using pages, the number of cleaning operations, the residual ink amount, the number of one time, the using state and the number of replacement of color ink and black ink, the longest print period, or the like may be suitably memorized in the memory section 10.

(0037)

(3) recycle judging process

Next, if the ink end detecting section 270 detects the ink end state by the information from the ink end detecting section 40 (S9), an end date of use is written into the memory section 10 (S10).

(0038)

In this state, the reading means 280 reads the information stored in the memory section 10 (S11) to inform the controlling section 260 of it and reads the set value information from the internal memory 330 to compare the former information with the latter information as follows.

(0039)

In this comparative operation, the information stored in the memory section 10 is compared with the possible recycle number, limit of lifetime, limit period which elapses after ink end, the highest or lowest temperature and humidity in the environment of use, and the like which are set so as to ensure



limit of lifetime suitable for ink. If there is condition which does not fit the set condition, an instruction of discarding the ink cartridge 100 is given, and if the condition fits all the set condition, an instruction of recycling the ink cartridge is given and all the process is completed.

(0040)

Namely, whether the information in the memory section 10 is the possible recycle number or not (S12), whether it is the limit of lifetime or not (S13), whether it is the predetermined period which elapses after the ink end or not (S14), whether the temperature and humidity in the environment of use are severe over the set limit or not, and the like are judged. If there is any one of the conditions which do not fit the set condition, the ink cartridge 100 can not be recycled and receives advice of discard (S16).

(0041)

Further, if the condition fits all the set condition, a recycle operation is instructed (S17) and all the process is completed.

(0042)

There is somewhat difference in the actual set value of the possible recycle number, the limit of lifetime, the predetermined period which elapses after ink end or the severe environment according to the kind of ink, the region of utilization of the printer 200 or the like. However, the respective set values can be generally set to be 10 times, 10 years, 200 days, and 10 to 40°C, which is verified to be without hindrance on precision of print.

(0043)

(Reference example)

In the above-described embodiment of this invention, the case of the ink jet recording apparatus and ink cartridge is described, however this invention can be also applied to the case of a developing device and toner cartridge. For example, as shown in Fig. 6, it is needless to say that reading means A1 and writing means A2 of a memory section are carried in a developing device A, a memory section B1 is mounted in a toner cartridge B, and whether the toner cartridge B can be recycled or not is suitably judged by connecting electrodes A3 and B2 to each other. As its content is common to that in said embodiment, the description thereof is omitted.

(0044)

(Effect of the Invention)

As described above, characteristic effects of this invention are as follows:

(0045)

① The ink cartridge is precisely recycled or discarded according to the using history indicating the state of use of the ink cartridge.

(0046)

② As the using history of the ink cartridge is cleared by only mounting the ink cartridge in the printer, the operation efficiency is improved.

(0047)

③ As the ink cartridge is recycled or discarded according to the environment of use of the ink cartridge, the print quality can be safely ensured.

(BRIEF DESCRIPTION OF DRAWINGS)

(Fig. 1)

Fig. 1 is a function block diagram of an ink jet recording apparatus in which an ink cartridge of an embodiment is mounted.

(Fig. 2)

Fig. 2 is an enlarged side view showing a chief portion of Fig. 1.

(Fig. 3)

Fig. 3 is a perspective view of an ink cartridge in Fig. 1.

(Fig. 4)

Fig. 4 is a schematic view of a memory section in the ink cartridge of the embodiment.

(Fig. 5)

Fig. 5 is a flowchart of the embodiment.

(Fig. 6)

Fig. 6 is an explanatory diagram of a chief portion of a developing device and toner cartridge as a reference example of this invention.

(Description of Symbols)

10	memory section
100	ink cartridge
200	ink jet recording apparatus
260	printing means